

(19)



Europäisches Patentamt
European Patent Office
Office européen des brevets



(11) Publication number:

0 533 934 A1

(12)

EUROPEAN PATENT APPLICATION
published in accordance with Art.
158(3) EPC

(21) Application number: **91914663.9**(51) Int. Cl.⁵: **F03B 7/00**(22) Date of filing: **22.08.91**(86) International application number:
PCT/JP91/01117(87) International publication number:
WO 92/16744 (01.10.92 92/25)(30) Priority: **20.03.91 JP 55216/91**(43) Date of publication of application:
31.03.93 Bulletin 93/13(84) Designated Contracting States:
FR IT(71) Applicant: **TONOUCHI, Kooji**
376-1, Sengen-cho 5 chome, Nishi-ku
Yokohama-shi, Kanagawa 220(JP)(72) Inventor: **TONOUCHI, Kooji**
376-1, Sengen-cho 5 chome, Nishi-ku
Yokohama-shi, Kanagawa 220(JP)(74) Representative: **Chauchard, Robert et al**
c/o Cabinet Malémont 42, avenue du
Président Wilson
F-75116 Paris (FR)(54) **HYDRAULIC POWER DEVICE.**

(57) A hydraulic power device comprising water wheel prime movers (1, 1A, 1B) serially connected to one another through power transmitting means (8) and each having a plurality of outer peripheral buckets (7) rotatable about respective horizontal rotary

shafts (4) in vertical planes. This hydraulic power device utilizes a natural water stream having no particular large head, and is used for an agricultural working device and a private power generation set and the like.

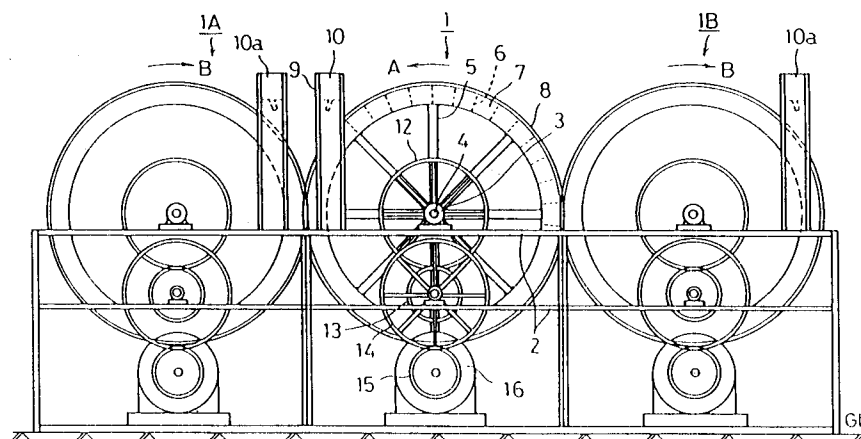


FIG. 1

EP 0 533 934 A1

FIELD OF TECHNOLOGY

The present invention relates to a hydraulic power device, and more particularly to a power device suitable for hydroelectric generation or the like.

BACKGROUND TECHNOLOGY

In view of the recent energy problems, the wide use of natural energy including wind power, hydraulic power, solar light, or the like is required, and a variety of power devices or electric generators have been proposed and developed. Among these, as the power devices with comparatively small capacity utilizing natural water stream, such as working devices for agriculture or private power generation, bucket -type hydraulic water wheels, made of such as wood, which rotate with respect to a horizontal axis in a vertical plane has been utilized from the ancient periods.

However, in a conventional power devices as described above, which utilize a comparatively small water head, it is necessary to considerably increase the radius and width of the water wheel, in order to obtain necessary amount of power capacity with a single device. This results in a limitation in manufacture or installation of the devices. Therefore, it was necessary to connect in parallel a plurality of water wheels having small size and small capacity.

In each of the plurality of wheels disposed in parallel, because of its small size, its moment of inertia is comparatively small. Further, its flywheel effect is not sufficient, so that the wheel is easily affected even by a comparatively short term changes such as in flow rate or flow velocity of the source water, or those in loads caused by the working devices.

Accordingly, the present invention is to provide a power device comprising a plurality of water wheels connected in series to overcome the aforementioned disadvantages of the conventional devices. Also, the invention provides a device producing a large output power with an improved flywheel effect in case that it is difficult to install a large scale single wheel.

DISCLOSURE OF THE INVENTION

The present invention is to provide a hydraulic power device comprising a plurality of water wheels serially connected to one another through a power transmitting means, and each having a plurality of outer peripheral buckets rotatable about respective horizontal rotary shaft.

The water wheels may be connected to each other through a large gear formed around each

wheel, or a chain transmission between the rotary shafts. As a result, a power of necessary capacity is obtained by the wheels having a radius of suitable dimension. Also the speed variation is minimized due to the increased overall flywheel effect produced by the plurality of wheels, which are serially connected to one another.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG.1 is a plan view of a serially connected three-wheel hydraulic power device according to the present invention; and

FIG.2 is a side elevational view of one water wheel of FIG.1.

BRIEF DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG.1 is a plan view illustrating a hydraulic power device, in which three water wheels are connected in series, according to the present invention. Numerals 1A and 1B are three water wheels each having substantially the same construction. The central water wheel 1 has a horizontal rotary shaft 4 which is rotatably supported by the bearings 3 disposed on the plurality of frames 2. Spokes 5 are radially mounted on the boss of the rotary shaft 4. A plurality of buckets 1 are continuously mounted on the periphery of the wheel 1. Each bucket 7 is separated from the adjacent one 7 by the radial wall 6 provided around the periphery of the wheel 1.

A plurality of teeth forming a transmitting means 8 are threaded with a same pitch around the periphery of both side faces of the wheel 1.

On the frame 2, adjacent to each side of water wheel 1, there are mounted vertical supports 9, on the top of which a water vessel 10 is disposed. Water is continuously supplied through a suitable water channel which is not shown. The wheel 1 is driven in rotation in the direction A. The water in each bucket successively is discharged through a channel which is not shown.

The rotational power generated on shaft 4 is transmitted through the gearset, including a gear 12, a pinion 13, gear 14, and a pinion 15, wherein the rotational speed is increased through two steps, to the generators 16 which are driven in a predetermined rotational speed.

Other water wheels 1A and 1B are connected to the central wheel 1 through each of large gears 8 provided on the periphery thereof. These wheels are driven by the water falling from the associated water reservoir 10a, each being disposed symmetrically with respect to the center of the wheel. As a result, the wheels 1A and 1B are rotated in the direction opposite to that of wheel 1, and therefore

the wheels are driven from each other to produce an increased power. The overall moment of inertia becomes 3 times that of one wheel to increase the flywheel effect. Accordingly, the speed variation of the generators 16 is largely minimized.

5

The inventor has constructed a hydraulic power device including three wheels made of steel each being 2.6 m in diameter and 0.6 m in width. The test result has proved that the device was small sized and rigid in construction, and convenient in manufacture, transportation, installation and maintenance thereof. Therefore, its wide use has been expected.

10

Instead of the three wheel construction, those including two wheels, and four or more wheels may be formed. The single wheel construction is also utilized. As the transmitting means between each wheel, sprocket wheels or power chains or the like may be used. In this case, the rotating direction of each wheel is the same to each other.

15

20

The water head of 1.5 m is used in the aforementioned embodiment. Also, the zero water head, in which the wheel directly engages the surface of water stream with its lowest bucket, may be used. Generators and speed increasing means are equipped not below but in the same horizontal level as the wheels.

25

The generators may be installed in one side of the wheels, instead of both sides thereof. Also, necessary number of generators connected in series may be installed. Powered loads other than generators, such as a lifting pump, threshing machine, or other power machines, may be connected.

30

Also, speed-up or speed-down means may be used as necessary.

35

INDUSTRIAL AVAILABILITY

As hereinabove stated, the hydraulic power device of the invention, comprising a plurality of serially connected wheels, is utilized in hydraulic generation, where a large-scaled single wheel is difficult to be installed due to physical limitations, such as in use for agricultural working devices and private power generation sets or the like.

40

45

Claims

1. A hydraulic power device comprising a plurality of prime movers, each having a plurality of outer peripheral buckets rotatable about a horizontal rotary shaft, and power transmitting means for serially connecting said prime movers to one another.

50

55

FIG. 1

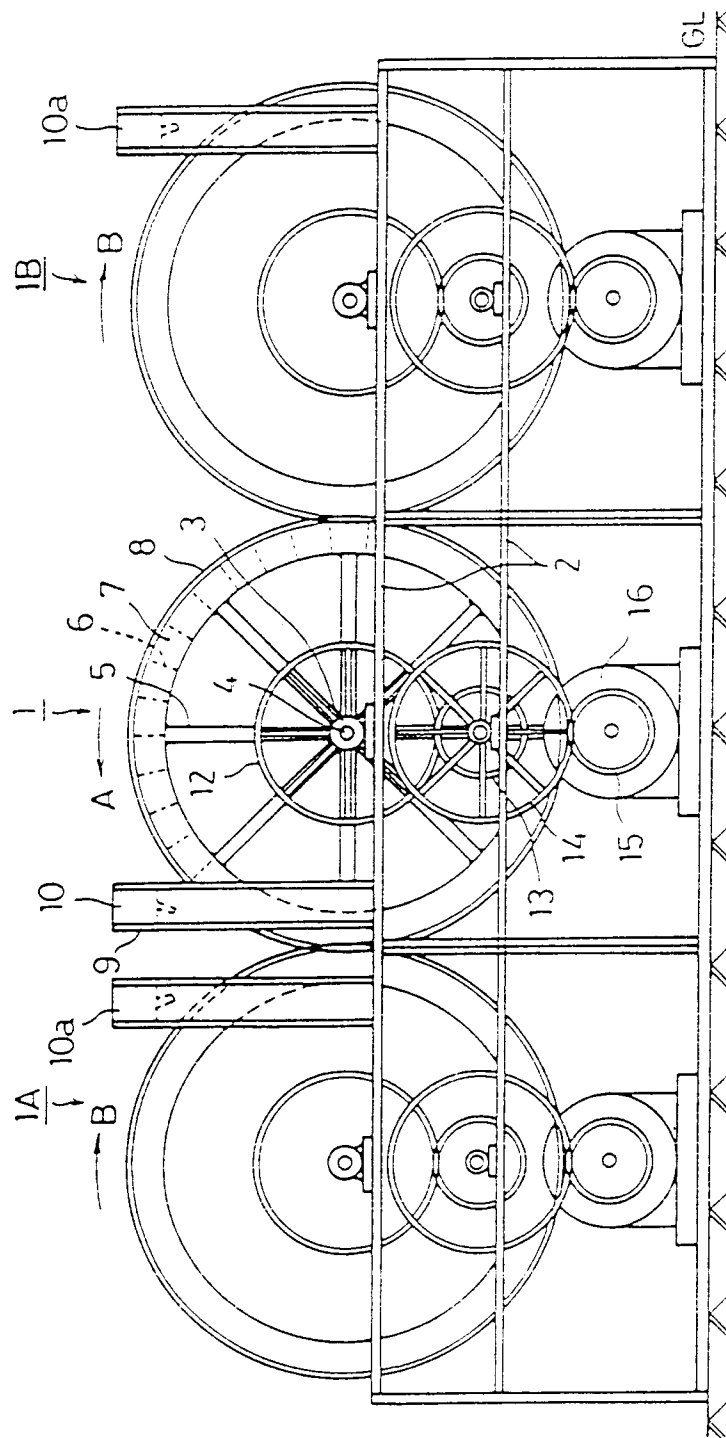
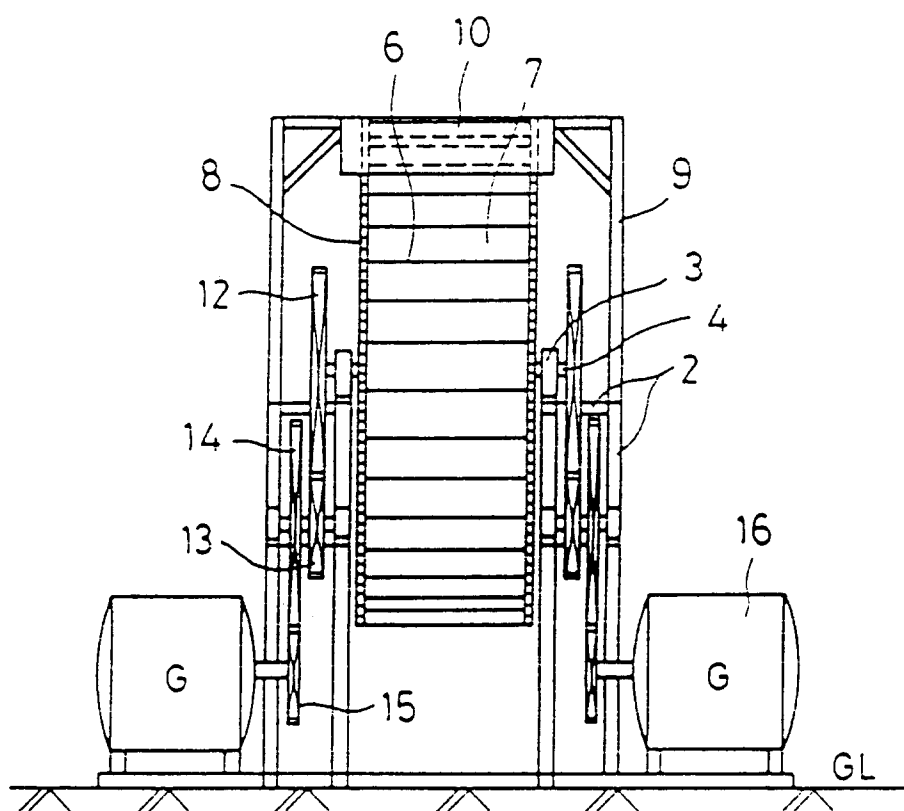


FIG. 2



INTERNATIONAL SEARCH REPORT

International Application No. PCT/JP91/01117

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC		
Int. Cl ⁵ F03B7/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System ¹	Classification Symbols	
IPC	F03B7/00	
Documentation Searched other than Minimum Documentation to the extent that such Documents are included in the Fields Searched ⁸		
Jitsuyo Shinan Koho	1926 - 1991	
Kokai Jitsuyo Shinan Koho	1971 - 1991	
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ¹⁰	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
X	JP, A, 52-144548 (Yoshio Kuragake), December 1, 1977 (01. 12. 77), Lines 8 to 20, column 7 & US, A, 4095422	1
X	US, A, 3958130 (Bernard Van Mechelen), March 18, 1976 (18. 03. 76)	1
X	JP, A, 59-183080 (Susumu Motohira), October 18, 1984 (18. 10. 84), Lines 13 to 17, column 2 (Family: none)	1
X	JP, B1, 24-2658 (Seiji Tago), July 19, 1949 (19. 07. 49), (Family: none)	1
Y	JP, A, 52-29548 (Yoshitaka Uemura), March 5, 1977 (05. 03. 77), Lines 5 to 9, column 1 (Family: none)	1
¹⁰ Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
November 25, 1991 (25. 11. 91)	December 17, 1991 (17. 12. 91)	
International Searching Authority	Signature of Authorized Officer	
Japanese Patent Office		